

# PATENT SPECIFICATION

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DRAWINGS ATTACHED



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## (54) IMPROVEMENTS IN AND RELATING TO TILTABLE CHAIRS

- (71) We, COMPAGNIE NATIONALE AIR FRANCE, of 1, Square Max Hymans, 75-Paris 15ème, France, a French Body Corporation, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—
- The present invention relates to tiltable or reclining chairs and aims to provide an improved form of such chair particularly, albeit not exclusively, suited for use as an aircraft chair or seat.
- According to the present invention there is provided a tiltable or reclining chair comprising a back mounted for reclining movement in each of a pair of side members of a frame by one of a first pair of corresponding pin and slot connections, the back being pivotally connected at or adjacent its lower end to the rear end of a seat and said latter pivotal connection being mounted for reclining movement in each of said pair of side members by one of a second pair of corresponding pin and slot connections, and said seat being mounted for reclining movement in each of said side members by one of a third pair of corresponding pin and slot connections the pin of which is positioned substantially intermediate the length of the seat, each said slot being elongate and discrete with the longitudinal axis of each slot of said first pair being inclined at 20° or substantially 20° from vertical and the longitudinal axis of each slot of said third pair being horizontal or substantially horizontal, and in which the longitudinal axes of the first, second and third discrete, elongate slots corresponding to each side member lie on respectively discrete first, second and third chords of the same circle with said first and second chords having adjacent ends meeting at a first discrete point on said circle outside of said first and second slots and said second and third chords having adjacent ends meeting at a second discrete point on said circle and with any two of said three chords subtending towards the centre of the circle an obtuse angle therebetween, and the arrangement being such as to permit a rearward and downward tilting or reclining of the upper end of the back and consequently forward and upward tilting of the front end of the seat with a downward movement of the rear end of the seat.
- The invention will be better understood by reading the following description which is given by way of example, and with the aid of the accompanying drawing in which there can be seen in a single figure a side view showing a vertical cross section of a chair embodying the invention.
- As shown, a chair includes a frame having a foot 1, a pair of side members one of which is shown at 2, and a couple of arms 3 only one of which is shown. The frame can be moved relative to the ground by various devices such as the fitting of foot 1 in guide rails, not shown. Such a device for rendering the frame movable relative to the floor has already been described in French Patent No. 1,369,343 of February 18, 1963. The foot 1 has, owing to its shape, the advantages with respect to the possibility of moving and housing the feet of the passenger behind the seat.
- Arms 3 are fixed. However, it is possible to pivot them relative to each corresponding side member 2 so as to vary their angle relative to the horizontal as required by the positions of the body of the passenger.
- In each side member 2 there are provided at least three discrete, elongate slots 4, 5 and 6, the slots in each side member corresponding with the slots in the other side member. The back 7 and the seat 8 of the chair are pivotally connected by a pivot pin 9. The back 7 has a pivot pin 10 on each side thereof. During the tilting or reclining movement, the back 7 assumes, for example, positions 7a, 7b and the seat 8 takes simultaneously corresponding positions 8a, 8b. During this tilting or reclining movement each pin 10 around which back 7 pivots, moves in the corres-

ponding one of slots 6 while each end of the pivot pin 9 moves in the corresponding one of slots 5 and each pivot pin 11 integral with seat 8 and, as shown, positioned substantially intermediate the length thereof, moves in the corresponding one of slots 4. Positions 10a, 10b, 9a, 9b, 11a, 11b, of pivot pins 10, 9 and 11 correspond to positions 7a, 8a and 7b, 8b of back 7 and seat 8. As shown, the longitudinal axis of each of slots 6 is inclined at 20° or substantially 20° from vertical and the longitudinal axis of each of slots 4 is horizontal or substantially horizontal.

The slots 4, 5 and 6 are so arranged as to permit without friction or blocking simultaneous movement of the various parts one relative to the other and relative to the frame. For example, as shown, the forward end of slot 5 is arranged level with or substantially level with the rear end of slot 4.

Modifications can be made to the above described embodiment. For example, the back 7 and/or seat 8 can each be made from a plurality of parts pivotally connected together. The back 7 can be made of two pivotally connected parts the upper part forming a head rest the position of which the passenger may wish to adjust to a certain angle with his back. In the same manner, the passenger may require that the front of the seat be more than slightly (as shown) raised when he or she is in a reclining or stretched position in order to minimize a tendency to slide off the front of the seat, or in order to ensure a higher level for his or her legs.

To enable such modifications, additional elongate slots can be provided in each side member of the frame, the axes of which additional slots are disposed as desired to provide the desired movement on reclining the front of the seat and said head rest, for example, and in which additional slots move additional pivot pins connecting the various parts of the back 7 or seat 8.

The various pivot pins 9, 10 and 11 and any other pivot pins can have rollers which aid movement within their respective slots.

A lock 13, which can be hydraulically operated and extensible, serves to immobilize the movable assembly constituted by the seat 8 and the back 7. The lock 13 is attached at one end to a fixed point 14 on the frame and at the other end to a point 14' under the movable seat 7. The lock 13 is controlled by a button 15. As long as the user does not touch the button, the movable assembly remains in the desired position.

An advantage of the above described embodiment of the invention is that it provides a tiltable or reclining chair, the pivot pins of which are movable thus enabling a passenger in, for example, an aircraft to

vary at will the angle of his body and to assume positions as stretched or reclined as possible in conjunction with a lesser rearward movement of the back than in previously known tiltable or reclining chairs; this increases comfort, reduces volume and accordingly increases efficiency. Finally, the distribution of the unit pressures on each part of the body is maintained in all positions which makes it possible to reduce the thickness of the cushion and the weight of the seats and consequently the cost of the internal equipment of the aircraft.

More particularly, as will be apparent from the drawing, if the longitudinal axis of each of the slots 5 and 6 is extended, the axis of the slot 6 being inclined at 20° or substantially 20° from vertical, the axes will meet at a first discrete point outside of said slots, if the longitudinal axis of each of the slots 4 and 5 is extended, the axis of slot 4 being horizontal or substantially horizontal, the axes will meet at a second discrete point outside of said slots, and treating the intersection of the left-hand end (see drawing) of the slot 4 with its longitudinal axis as a third discrete point, a circle can be described through said three points. The longitudinal axis of each of the three discrete elongate slots of each side member of the frame can then be seen to lie on respectively discrete first, second and third chords of the same circle with said first and second chords having adjacent ends meeting at the first discrete point of said circle and said second and third chords having adjacent ends meeting at the second discrete point on said circle and with any two of said three chords subtending an obtuse angle therebetween. Such an arrangement of the pin and slot connections permits a rearward and downward tilting or reclining of the upper end of the back and consequent forward and upward tilting of the front end of the seat with a downward movement of the rear of end of the seat.

#### WHAT WE CLAIM IS:—

1. A tiltable or reclining chair comprising a back mounted for reclining movement in each of a pair of side members of a frame by one of a first pair of corresponding pin and slot connections, the back being pivotally connected at or adjacent its lower end to the rear end of a seat and said latter pivotal connection being mounted for reclining movement in each of said pair of side members by one of a second pair of corresponding pin and slot connections, and said seat being mounted for reclining movement in each of said side members by one of a third pair of corresponding pin and slot connections, the pin of which is positioned substantially inter-

- mediate the length of the seat, each said slot being elongate and discrete with the longitudinal axis of each slot of said first pair being inclined at 20° or substantially 20° from vertical and the longitudinal axis of each slot of said third pair being horizontal or substantially horizontal, and in which the longitudinal axes of the first, second and third discrete, elongate slots corresponding to each side member lie on respectively discrete first, second and third chords of the same circle with said first and second chords having adjacent ends meeting at a first discrete point on said circle outside of said first and second slots and said second and third chords having adjacent ends meeting at a second discrete point on said circle and with any two of said three chords subtending towards the centre of the circle an obtuse angle therebetween, and the arrangement being such as to permit a rearward and downward tilting or reclining of the upper end of the back and consequent forward and upward tilting of the front end of the seat with a downward movement of the rear end of the seat. 25
2. A chair according to Claim 1, having a lock attached to the frame and located under the seat, release of the lock permitting the tilting movement of the back and seat. 30
3. A chair according to Claim 1 or 2, in which the back comprises a plurality of pivotally interconnected parts. 35
4. A chair according to Claim 1, 2 or 3, in which the seat comprises a plurality of pivotally interconnected parts.
5. A chair, constructed and arranged substantially as hereinbefore described with reference to, and as illustrated in, the Figure of the accompanying drawing. 40
- P. F. JENNISON,  
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Agent for the Applicants.

